Meningitis

Dr. Nashwan Mansoor

Meningitis

- **Acute infection of the meninges presents with a characteristic combination of pyrexia, headache and meningism.**
- **Meningism consists of:-**
  - **Headache.**
  - **Photophobia.**
  - **Stiffness of the neck.**

- **Meningism often accompanied by other signs of meningeal irritation, including:-**
  - **Kernig's sign (extension at the knee with the hip joint flexed causes spasm in the hamstring muscles).**

  - **Brudzinski's sign (passive flexion of the neck causes flexion of the hips and knees).**

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- **Meningism is not specific to meningitis and can occur in patients with subarachnoid hemorrhage.**
- **The severity of clinical features varies with the causative organism, as does the presence of other features such as a rash.**
- **Abnormalities in the CSF are important in distinguishing the cause of meningitis.**

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Meningitis

❖ Viral meningitis :-

- **Viruses are the most common cause of meningitis, usually resulting in a benign and self-limiting illness requiring no specific therapy.**
- **It is much less serious than bacterial meningitis unless there is associated encephalitis.**
- **The most common being enteroviruses specific immunization is not employed.**
- **The mumps virus is a common cause.**

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Meningitis

❖ Viral meningitis :-

➢ **A number of viruses can cause meningitis.**

• Enteroviruses (echo, Coxsackie, polio)	• Epstein–Barr
• Mumps	• HIV
• Influenza	• Lymphocytic choriomeningitis
• Herpes simplex	• Mollaret's meningitis (herpes simplex virus type 2)
• Varicella zoster	

Meningitis

❖ Viral meningitis :-

❑ Clinical features:-

➢ **Viral meningitis occurs mainly in children or young adults, with:-**

- **Acute onset of headache, usually the most severe feature.**
- **Irritability.**
- **The rapid development of meningism.**
- **May be a high pyrexia.**
- **Focal neurological signs are rare**

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Meningitis

❖ Viral meningitis :-

❑ Investigations :-

- ➢ **The diagnosis is made by lumbar puncture.**
- ➢ **CSF usually contains an excess of lymphocytes.**
- ➢ **Glucose and protein levels are commonly normal, the latter may be raised.**
- ➢ **Important to verify that the patient has not received antibiotics, CSF lymphocytosis can also be found in partially treated bacterial meningitis.**

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Meningitis

❖ Viral meningitis :-

❑ Management :-

- ➢ **No specific treatment and the condition is usually benign and self-limiting.**
- ➢ **The patient should be treated symptomatically in a quiet environment.**
- ➢ **Recovery usually occurs within days.**
- ➢ **Meningitis may also occur as a complication of a systemic viral infection such as mumps, measles, infectious mononucleosis, herpes zoster and hepatitis.**
- ➢ **Whatever the virus, complete recovery without specific therapy is the rule.**

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Meningitis

❖ Bacterial meningitis :-

➢ **Bacteria can cause meningitis but geographical patterns vary.**

Age of onset	Common	Less common
Neonate	Gram-negative bacilli (Escherichia coli, Proteus) Group B streptococci	Listeria monocytogenes
Pre-school child	Hemophilus influenzae Neisseria meningitidis Streptococcus pneumoniae	Mycobacterium tuberculosis
Older child and adult	N. meningitidis (subtypes Strep. pneumoniae	L. monocytogenes M. tuberculosis Staphylococcus aureus (skull fracture) H. influenzae

Meningitis

❖ Bacterial meningitis :-

- Usually part of a bacteraemia illness, although direct spread from an adjacent focus of infection in the ear, skull fracture or sinus can be causative.

- Antibiotics have rendered this less common but mortality and morbidity remain significant.

- An important factor in determining prognosis is early diagnosis and the prompt initiation of appropriate therapy.

- The meningococcus and other common causes of meningitis are normal commensals of the upper respiratory tract.

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❖ Bacterial meningitis :-

- **New and potentially pathogenic strains are acquired by the air-borne route but close contact is necessary.**
- **Epidemics of meningococcal meningitis occur, particularly in cramped living conditions or where the climate is hot and dry.**
- **The organism invades through the nasopharynx, producing sepsis and leading to meningitis.**

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Meningitis

❖ Bacterial meningitis :-

❑ Pathophysiology :-

- The meningococcus (Neisseria meningitidis) is now the most common cause of bacterial meningitis in Western Europe after Streptococcus pneumoniae.
- In the USA Hemophilus influenzae remains common.
- In India, H. influenzae B and Strep. pneumoniae are probably the most common causes of bacterial meningitis, especially in children.
- Streptococcus suis is a rare zoonotic cause of meningitis associated with porcine contact.

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Meningitis

❖ Bacterial meningitis :-

❑ Pathophysiology :-

- **Infection stimulates an immune response, causing the pia–arachnoid membrane to become congested and infiltrated with inflammatory cells.**
- **Pus then forms in layers, which may later organize to form adhesions.**
- **These may obstruct the free flow of CSF, leading to hydrocephalus, or they may damage the cranial nerves at the base of the brain.**
- **Hearing loss is a frequent complication.**

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Meningitis

❖ Bacterial meningitis :-

❑ Pathophysiology :-

- The CSF pressure rises rapidly, the protein content increases.
- A cellular reaction that varies in type and severity according to the nature of the inflammation and the causative organism.
- An obliterative endarteritis of the leptomeningeal arteries passing through the meningeal exudate may produce secondary cerebral infarction.
- Pneumococcal meningitis is often associated with a very purulent CSF and a high mortality, especially in older adults.

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Meningitis

❖ Bacterial meningitis :-

❑ Clinical features :-

- **Headache, drowsiness, fever and neck stiffness are the usual presenting features.**

- **In severe bacterial meningitis the patient may be comatose, later developing focal neurological signs.**

- **Ninety per cent of patients with meningococcal meningitis will have two of the following: fever, neck stiffness, altered consciousness and rash.**

- **When accompanied by sepsis, presenting signs may evolve rapidly, with abrupt onset of obtundation due to cerebral oedema.**

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Meningitis

❖ Bacterial meningitis :-

❑ Clinical features :-

➢ Complications of meningococcal sepsis are:-

- **Meningitis.**
- **Rash (morbilliform, petechial or purpuric).**
- **Shock.**
- **Intravascular coagulation.**

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Meningitis

❖ Bacterial meningitis :-

❑ Clinical features :-

➢ Complications of meningococcal sepsis are:-

- **Renal failure.**
- **Peripheral gangrene.**
- **Arthritis (septic or reactive).**
- **Pericarditis (septic or reactive).**

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Meningitis

❖ Bacterial meningitis :-

❑ Clinical features :-

➢ Chronic meningococcemia;-

- **A rare condition in which the patient can be unwell for weeks or even months With;-**

✓ **Recurrent fever.**

✓ **Sweating.**

✓ **Joint pains.**

✓ **Transient rash.**

- **Usually occurs in the middle-aged and elderly, and in those who have previously had a splenectomy.**

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❖ Bacterial meningitis :-

❑ Clinical features :-

- In pneumococcal and Hemophilus infections there may be an accompanying otitis media.

- Pneumococcal meningitis may be associated with pneumonia especially in:-
  - Older patients.
  - Alcoholics.
  - patients with hypersplenism.

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❖ Bacterial meningitis :-

❑ Clinical features :-

➢ **Listeria monocytogenes is:-**

✓ **An increasing cause of meningitis and rhombencephalitis (brainstem encephalitis) in the:-**

- **Immunosuppressed.**
- **People with diabetes.**
- **Alcoholics.**
- **Pregnant women.**

✓ **Can also cause meningitis in neonates.**

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Meningitis

❖ Bacterial meningitis :-

❑ Investigations :-

- **Lumbar puncture is mandatory unless there are contraindications.**

- **contraindications of Lumbar puncture If the patient :-**
  - **Is drowsy.**
  - **Has focal neurological signs or seizures.**
  - **Is immunosuppressed.**
  - **Has undergone recent neurosurgery or has suffered a head injury.**

- **Should be obtain a CT to exclude a mass lesion (such as a cerebral abscess) before lumbar puncture because of the risk of coning.**

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Meningitis

❖ Bacterial meningitis :-

❑ Investigations :-

- **This should not delay treatment of presumed meningitis.**

- **If lumbar puncture is deferred or omitted, it is essential to take blood cultures and to start empirical treatment.**

- **Lumbar puncture will help differentiate the causative organism.**

- **In bacterial meningitis;**

✓ **The CSF is cloudy (turbid) due to the presence of many neutrophils (often > 1000 × 106 cells/L).**

✓ **The protein content is significantly elevated.**

✓ **The glucose reduced.**

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Meningitis

❖ Bacterial meningitis :-

❑ Investigations :-

- **Gram film and culture may allow identification of the organism.**
- **Blood cultures may be positive.**
- **PCR techniques can be used on both blood and CSF to identify bacterial DNA.**
- **These methods are useful in detecting meningococcal infection and in typing the organism.**

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Meningitis

❖ Bacterial meningitis :-

❑ Management :-

- An untreated mortality rate of around 80%, so action must be swift.

- In suspected bacterial meningitis the patient should be given parenteral benzylpenicillin immediately (intravenous is preferable) and prompt hospital admission should be arranged.

- The only contraindication is a history of penicillin anaphylaxis.

- Recommended empirical therapies.

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Meningitis

❖ Bacterial meningitis :-

❑ Management :-

- **The preferred antibiotic when the organism is known after CSF examination.**

- **Adjunctive glucocorticoid therapy is useful in reducing hearing loss and neurological sequelae in both children and adults in developed countries where the incidence of penicillin resistance is low.**

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Meningitis

- ❖ **Bacterial meningitis :-**
- ❑ **Management :-**
- ➢ **In meningococcal disease:-**
  - **Mortality is doubled if the patient presents with features of sepsis rather than meningitis.**
  - **Individuals likely to require intensive care facilities and expertise include those with cardiac, respiratory or renal involvement, and those with CNS depression prejudicing the airway.**
  - **Early endotracheal intubation and mechanical ventilation protect the airway and may prevent the development of the acute respiratory distress syndrome (ARDS).**

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Meningitis

❖ **Bacterial meningitis :-**

❑ **Management :-**

➢ **Adverse prognostic features include:-**

- **Hypotensive shock.**
- **A rapidly developing rash.**
- **A hemorrhagic diathesis.**
- **Multisystem failure.**
- **Age over 60 years.**

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Meningitis

❖ Bacterial meningitis :-

❑ Prevention of meningococcal infection :-

- **Close contacts of patients with meningococcal infection should be given 2 days of oral rifampicin.**
- **In adults, a single dose of ciprofloxacin is an alternative.**
- **If not treated with ceftriaxone, should be given similar treatment to clear infection from the nasopharynx before hospital discharge.**
- **Vaccines are available for most meningococcal subgroups but not group B, which is one of the most common serogroups isolated in many countries.**

Meningitis

❖ Tuberculous meningitis :-

- ➢ **Is now uncommon in developed countries except in immunocompromised.**

- ➢ **Is still seen in;-**
  - ○ **Those born in endemic areas.**
  - ○ **Developing countries.**

- ➢ **More frequently as a secondary infection in patients with the acquired immunodeficiency syndrome (AIDS).**

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Meningitis

❖ Tuberculous meningitis :-

❑ Pathophysiology :-

- **Tuberculous meningitis most commonly occurs shortly after a primary infection in childhood or as part of miliary tuberculosis.**

- **The usual local source of infection is a caseous focus in the meninges or brain substance adjacent to the CSF pathway.**

- **The brain is covered by a greenish, gelatinous exudate, especially around the base, and numerous scattered tubercles are found on the meninges.**

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Meningitis

❖ Tuberculous meningitis :-

❑ Clinical features :- Symptoms

- Headache.
- Vomiting.
- Low-grade fever.
- Lassitude.
- Depression.
- Delirium.
- Behavior changes.

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Meningitis

❖ Tuberculous meningitis :-

❑ Clinical features :- Signs

- Meningism (may be absent).
- Oculomotor palsies.
- Papilledema.
- Depression of conscious level.
- Focal hemisphere signs.

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Meningitis

❖ Tuberculous meningitis :-

❑ Clinical features :- Staging of severity

- Stage I (early): non-specific symptoms and signs without alteration of consciousness.
- Stage II (intermediate): altered consciousness without coma or delirium *plus* minor focal neurological signs.
- Stage III (advanced): stupor or coma, severe neurological deficits, seizures or abnormal movements.

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Meningitis

❖ Tuberculous meningitis :-

❑ Clinical features :-

- **Onset is much slower than in other bacterial meningitis over 2–8 weeks.**
- **If untreated, tuberculous meningitis is fatal in a few weeks but complete recovery is usual if treatment is started at stage I.**
- **When treatment is initiated later, the rate of death or serious neurological deficit may be as high as 30%.**

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Meningitis

❖ Tuberculous meningitis :-

❑ Investigations :-

- **Lumbar puncture should be performed if the diagnosis is suspected.**

- **The CSF is under increased pressure:-**
  - **Usually clear but, when allowed to stand, a fine clot (‘spider web’) may form.**
  - **The fluid contains up to 500 × 106 cells/L, predominantly lymphocytes, but can contain neutrophils.**
  - **A rise in protein.**
  - **A marked fall in glucose.**

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Meningitis

❖ Tuberculous meningitis :-

❑ Investigations :-

- **The tubercle bacillus may be detected in a smear of the centrifuged deposit from the CSF but a negative result does not exclude the diagnosis.**

- **The CSF should be cultured but, as this result will not be known for up to 6 weeks, treatment must be started without waiting for confirmation.**

- **Brain imaging may show hydrocephalus, brisk meningeal enhancement on enhanced CT or MRI, and/or an intracranial tuberculoma.**

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Meningitis

❖ Tuberculous meningitis :-

❑ Management :-

- **As soon as the diagnosis is made or strongly suspected, chemotherapy should be started using one of the regimens that include pyrazinamide.**

- **The use of glucocorticoids in addition to ant tuberculous therapy has been controversial.**

- **Recent evidence suggests that it improves mortality, especially if given early, but not focal neurological damage.**

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Meningitis

❖ Tuberculous meningitis :-

❑ Management :-

- **Surgical ventricular drainage may be needed if obstructive hydrocephalus develops.**

- **Skilled nursing is essential during the acute phase of the illness.**

- **Adequate hydration and nutrition must be maintained.**

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Good luck